SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Plant stock.

B. Excavation and backfill.

C. Soil preparation.

D. Herbicide application.

E. Rough and finish grading.

F. Planting of trees and shrubs.

G. Decomposed granite mulch.

H. Drainage test and auger holes.

I. Inspections.

J. Maintenance and plant establishment.

1.02 RELATED SECTIONS

A. Slope protection and hydro seeding are specified in Section 31 35 00 - Slope Protection.

B. Landscape irrigation is specified in Section 32 84 00 - Planting Irrigation.

1.03 MEASUREMENT AND PAYMENT

A. Measurement: Landscape planting including excavation, backfilling, and topsoil, will be measured for payment by the lump-sum method, acceptably performed and completed.

B. Payment: Landscape planting, including excavation, backfilling, and topsoil, will be paid for at the Contract lump-sum price, as indicated in the Bid Schedule of the Bid Form.

1.04 SYSTEM DESCRIPTION

A. Soil used within landscaped areas shall be a friable condition at time of displacement including during transportation, placement, cultivation, and planting.

B. Friable in these specifications refers to the structure and moisture content of soil. Friable soil shall be understood to mean soil that crumbles easily in the hand, does not stick to the hand, and does not form a ball when squeezed. Friable soil is not wet or muddy but is moist and damp. Obtain Engineer's determination of soil condition acceptability prior to installation and working of soils.

C. Soils in landscape areas that are worked when not friable shall be removed at the Contractor's expense and replaced with friable imported topsoil complying with the specifications for topsoil herein.

1.05 SUBMITTALS

A. General: Refer to Section 01 33 00 - Submittals, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Soil Analysis Report: Submit a soil analysis report of the proposed topsoil from a California-licensed soil-testing laboratory. The Soil Analysis Report shall include the requirements specified in Article 2.15 herein. Topsoil shall not be incorporated in the landscape planting work until the Engineer has approved the Soil Analysis Report.

C. Product Data: Submit manufacturer's product data for the following items:

1. Root barrier

2. Tree stakes and ties

D. Product Data for Toxicity: Submit California-licensed Pest Control Advisor's program and manufacturer's literature, including toxicity levels, for each pesticide and herbicide proposed for use in the landscape planting work.

E. Samples: Submit three samples and manufacturer's guaranteed analysis of the following items:

1. Imported topsoil, including source of topsoil;
2. Fertilizers, nitrogen stabilized organic amendment, and chemicals;
3. Top dressing;
4. Root barrier; and
5. Landscape fabric.

F. Plant Substitutions: Plant substitutions will not be permitted unless the Contractor furnishes the Engineer with written evidence from no less than three nurseries that the plants specified are not obtainable. Such evidence shall be submitted within 30 calendar days after the effective date of the Notice to Proceed.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications: Installer shall be a specialist in installing and planting landscape products, with documented experience in performing landscape work of comparable size, scope, and quality.

B. Supervision: Provide the services of at least one qualified person who shall be present at all times during execution of the work of this Section. That individual, who shall direct the work, shall be thoroughly familiar with the types of materials being installed and the proper methods for their installation.

C. Engineer's Observance:

1. It is required that the work specified herein be observed by the Engineer. The Contractor shall request observance at least 24 hours in advance of the time such observance is required. Observance is required on the following portions of the work:

   a. During preliminary grading and soil preparation;

   b. When shrubs and trees are spotted for planting, before planting holes are excavated;

   c. When finish grading has been completed, and before installation of plants; and

   d. When planting and other work has been completed.

2. The Contractor shall require the supervisor of the landscape planting work to be on the site at the time of each such observance.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Refer to Section 01 60 00 - Product Requirements, for requirements.

B. Delivery:

1. Deliver fertilizer and soil conditioner to the site in original unopened containers bearing manufacturer's guarantied chemical analysis, weight, manufacturer's name, trademark, and conformance with state law.

2. Deliver plant materials to the jobsite no earlier than three calendar days prior to planting. Deliver plants with legible identification labels, as follows:

   a. Label trees, evergreens, bundles, or containers of like species or ground cover plants.

   b. State correct plant name and size indicated on the plant list.

3. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.

4. Transport plants in enclosed trucks. If trees are too large for enclosed trucks and are transported in open trucks, trees shall be wrapped to prevent damage and windburn. Adequate protection shall be placed between trees so that trunks are not scarred in transport and branches are not broken. Tree trunks shall be wrapped with protective covering prior to handling and loading. Covering shall be removed at the time of plant materials inspection at the job site.

5. Notify the Engineer in advance of delivery of plant materials, and submit an itemized list of the plants in each delivery.

C. Handling: Exercise care in handling, loading, unloading, and storing of plant materials. Plant materials damaged in any way shall be discarded and replaced with undamaged materials.

D. Storage:

1. Protect plant materials from wind, excessive sun, and drying out.

2. Fertilizer and lime shall not be stored with any other landscape material. Herbicides and pesticides shall not be stored with any other landscape material.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Planting shall not be performed during weather conditions that may adversely affect landscape materials, plants, and planting conditions.

1.09 SITE CONDITIONS AND SCHEDULING

A. Landscape work shall not begin until structures, utilities, paving, and other improvements, which require access to or through planting areas, have been installed and accepted by the Engineer. Planting work shall not begin until the landscape irrigation system is installed in place, tested, and accepted by the Engineer.

1.10 PLANT ESTABLISHMENT PERIOD

A. The Plant Establishment Period shall be Type 1, as defined in the Caltrans Standard Specifications, Section 20-4.08, "Plant Establishment Work", except that it shall be for a period of 120 calendar days following the Engineer's written acceptance of the work.

B. Upon completion of all planting and clean-up operations, notify the Engineer, in writing, a minimum of three days in advance, to request a final inspection. The Plant Establishment Period may begin only after the Engineer has given written acceptance of the landscape irrigation system installation.

C. Calendar days during which no work will be required, as determined by the Engineer, will be credited as plant establishment calendar days, regardless of whether or not the plant establishment work has been performed.

D. Calendar days when the plant establishment work has not been adequately performed, including watering plants, replacing unsuitable plants, repairing erosion damage, and performing weed, rodent, and other pest control as determined necessary by the Engineer, will not be credited as plant establishment calendar days.

E. Upon completion of the Plant Establishment Period, submit a written request for inspections by the Engineer as specified in Articles 3.11, 3.12 and 3.13 herein.

1.11 GUARANTY

A. Refer to the General Conditions Article GC4.9, Guaranty of Work, for Contract requirements.

B. Guaranty that trees, shrubs, groundcovers, and other plant materials will take root and grow vigorously within one year after final acceptance of plantings, when such plants have received normal care and maintenance.

C. The guaranty shall include replacement of trees and other plant materials that die back and lose the form and size as originally specified, even though they may have taken root and are growing after the die-back.

D. Corrective work for the purposes of General Conditions Article GC4.9.2, shall include removal and replacement of all guarantied plant materials which, for any reason, fail to meet the requirements of the guaranty. Replacements shall meet the same requirements as specified for the original materials. Replacements shall carry the same guaranty period that shall start from the time the replacements are planted and accepted.

PART 2 - PRODUCTS

2.01 PLANT STOCK

A. Plant stock and materials are indicated in the Planting List or Schedule on the Contract Drawings. Provide trees and plants of the varieties, sizes, and quantities indicated. Provide nursery-grown stock only, which is free from insect pests and diseases.

B. Plants shall comply with Federal and State laws requiring inspection for plant diseases and infestations. Inspection certificates required by law shall accompany each shipment of plants, and the certificates shall be delivered to the Engineer. Plants shall be true to species, varieties, and the sizes indicated, and shall be labeled in accordance with the recommended practice of the American Association of Nurserymen.

C. Label trees and bundles, containers or flats of the same shrub, ground cover and vine with durable waterproof labels and weather resistant ink. Labels shall state the correct plant name and size as specified in the Plant List on the Contract Drawings, and shall be legible for 60 days after delivery to the planting site. Plant material that is not labeled will be rejected.

D. Plants shall be healthy, shapely, and well-rooted. Roots shall show no evidence of having been root bound, restricted, or deformed. Plant material that has just been upgraded in container size will be rejected. Root condition of plants in containers will be inspected by the Engineer by removal of earth from the roots of not less than two plants of each species or variety from each source. Plant materials requiring inspection by the Engineer shall be assembled and available for such inspections. If the sample plants inspected are found to be defective, the Engineer reserves the right to reject the entire lot or lots of plants represented by the defective samples.

E. Trees shall have straight trunks with the leader intact, undamaged, and uncut. Old abrasions and cuts shall be completely calloused over. Trees shall be measured when their branches are in their normal position. The height of a tree shall be measured from root crown to top of plant. The width of a tree shall be measured at branching at the widest point. Sizes shown on the Contract Drawings are before pruning. Trees shall not be pruned prior to delivery except upon approval of the Engineer.

F. Trees shall be well tapered in the trunk so that when the nursery stake is removed, the tree supports itself upright without further staking. Trees shall have a main leader. The main

branches shall be spaced vertically and alternately along the trunk. Branching shall not be concentrated in one location and there shall be no severe crossing of branches. Branches shall be smaller in diameter than the trunk. Branch attachments shall be free of embedded bark. Branching along the lower two-thirds of the trunk shall have at least one half of the foliage of the tree.

G. Rejected plant materials shall be removed from the site and replaced with materials that conform to specified requirements.

H. Plant material shall be grown under similar climatic conditions to those found at the project site.

I. Ground cover and vines shall be rooted plants, grown in flats unless indicated otherwise on the Contract Drawings, or as approved by the Engineer.

2.02 TOPSOIL

A. Topsoil shall be obtained from sources within the site of the work, or shall consist of imported topsoil obtained from sources outside the site, or from both such sources. Stripped site soil, if used as topsoil, shall meet the requirements specified herein.

B. Topsoil shall consist of fertile, friable soil of loamy character, and shall contain organic matter in amounts normal to the region. Imported topsoil shall be obtained from well-drained arable and fertile agricultural land and shall be free from refuse, roots, heavy or stiff clay, stones larger than one inch in size, coarse sand, noxious seeds, sticks, brush, litter, grasses, weeds, toxic waste, and other deleterious substances detrimental to the health of plants, animals, and humans. Imported topsoil shall be capable of sustaining healthy plant life.

C. Topsoil shall have no inherent tendency towards compaction due to texture or soil structure or both as indicated in the soils analysis.

2.03 ORGANIC SOIL AMENDMENT

A. Soil amendment shall be nitrogen-stabilized sawdust. Use of treated, preserved, or painted wood products is not acceptable. Soil amendment shall be derived from a combination of fir and pine or cedar wood, free of weed seed, dust, and objectionable material, and containing the following physical properties:

Percent Passing	Sieve Size
95 - 100 percent	9.51 mm (3/8 inch)
90 - 95 percent	6.35 mm (1/4 inch)
85 - 90 percent	2.38 mm (No. 8, 8 mesh)
15 - 20 percent	500 Micron (No. 35, 32 mesh)

B. Soil amendment shall contain the following chemical elements and compounds:

1. Nitrogen Content (dry weight): 0.56 percent - 0.84 percent

2. Iron Content: Minimum 0.08 percent diluted acid soluble Fe on a dry weight basis.

3. Soluble Salts: Maximum 4.0 millimohos centimeter at 25 degrees Celsius as determined by the saturation extract method.

4. Ash (dry weight): 0 - 8.0 percent

2.04 FERTILIZER

A. Fertilizer shall be a commercial inorganic fertilizer in a granular and pelleted form. Fertilizer shall be delivered to the site in containers labeled in accordance with the applicable State of California, Department of Agriculture, regulations, bearing the warranty of the producer for the grade furnished. It shall be uniform in composition, dry, and free flowing. Provide fertilizer as follows:

1. Planted Areas: Pelleted type, with analysis of 6-20-20 (N-P-K), and granular type 16-6-8 (N-P-K).

2. Planting Holes: Tablets, 21-gram size, with an analysis of 20-10-5 (N-P-K).

2.05 HERBICIDES

A. Herbicides, including pre-emergent herbicide, shall be compatible with indicated plant materials. Proof of such compatibility shall be included in the pesticide and herbicide program submitted under Article 1.05 D herein.

B. The program shall specify the waiting period between spraying and planting.

C. Herbicides shall not sterilize the soil.

2.06 TOP DRESSING

A. Provide top dressing mulch of one to two-inch medium-sized redwood bark mulch. Mulch shall include no wood pieces.

2.07 BACKFILL

A. Backfill material for planting holes shall be topsoil or excavated soil that complies with topsoil specifications herein.

2.08 TREE STAKES AND TIES

A. Tree Stakes: 3-inch diameter by 10 feet, straight, close-grained, lodge pole pine, pointed at one end. Stakes shall be pointed prior to preservative pressure-treatment with copper napthanate that shall penetrate stake surfaces to a minimum depth of 1/4 inch.

B. Tree ties: Corded rubber tire strips - 1 inch wide by 1/4 inch to 1/2 inch thick by length as required. Strips shall not contain steel within or have wire tie ends.

C. Guy Wire: No. 12 gage galvanized soft steel wire.

2.09 ROOT BARRIERS

A. Provide commercially available manufactured root barriers, consisting of polyvinyl chloride or polypropylene sheeting having ultraviolet inhibitors and a minimum thickness of 0.085 inch. Barriers shall be either factory preformed into the circular shape shown, or have an integrated joining system for instant assembly into the final shape. Glued joints will not be acceptable.

B. Root barrier sheeting shall have horizontal tabs to prevent root growth from lifting the barrier. These tabs shall be spaced vertically not less than 8 inches on centers, and horizontally not less than 8 inches on centers. Depth of these tabs shall be not less than 3/8 inch at its widest point.

C. Root barrier sheeting shall have vertical fins running the full length on the inside face of the barrier at 90 degrees to the inside face, to direct root growth downwards. These fins shall be not less than 6 inches on centers, and its width shall be not less than 1/2 inch.

D. Sheeting shall have continuously reinforced top no less than 3/8 inch wide.

2.10 WATERING HOLES

A. Provide schedule 40 polyvinyl-chloride (PVC) pipe as indicated for watering holes.

2.11 LANDSCAPE FABRIC

A. Geotechnical landscape filter fabric with ultraviolet ray protection. Landscape filter fabric shall provide soil stabilization and drainage through the fabric. Include steel or plastic soil-anchorage staples for holding fabric in place during the plant-establishment period.

2.12 DECOMPOSED GRANITE MULCH

A. Decomposed granite shall be crushed granite rock screenings, graded from 1/4-inch particles to dust, with uniform tan or buff color. Decomposed granite shall conform with the following aggregate gradation:

Sieve Size	% Passing
No. 4	95-100
No. 30	30-50
No. 200	5-15

2.13 VITAMIN B-1 SOLUTION

A. Provide vitamin B-1 solution for reducing shock to plants when transplanting.

2.14 SOURCE QUALITY CONTROL

A. The Engineer will inspect the source of supply (landscape nursery) of the proposed plant materials prior to shipment to the site. Refer to the General Conditions, Article GC6.5, for requirements.

B. Plant materials shall be properly labeled as herein before specified, before the Engineer's inspection of proposed plant materials. Plant materials which do not conform with specified requirements will be rejected, and shall be replaced with Engineer-approved plants.

C. Notify the Engineer at least ten days before shipment of any plant materials from the source of supply.

2.15 SOIL ANALYSIS REPORT

A. Provide soil tests that include the following requirements:

1. Soil Fertility: Half-saturation percent, pH, salinity, nitrate, ammonium, phosphate, potassium, calcium, magnesium.

2. Agricultural Suitability: pH, salinity, boron, Sodium Absorption Ratio (SAR) using saturation paste extract.

3. Particle Size/Appraisal: pH, salinity, organic percent, USDA Particle size.

4. Germination (bio-assay) test.

5. Tendency towards compaction.

B. The Soil Analysis Report shall include a statement that the laboratory has reviewed the planting plan and the planting specifications, and that its recommendations respond to the specific needs of the project.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate layout and installation of plant materials with installation of the irrigation system to ensure that there will be complete and full irrigation coverage of the planted areas.

3.02 EXCAVATION AND BACKFILL

A. Excavate and backfill areas to be landscaped as indicated and specified herein.

B. Excavations for soil removal shall be to within 6 inches of back of curb or edge of walk. The Contractor shall be responsible for protecting and maintaining the integrity of compacted base rock and sub grade materials under paving and curbs, and for protecting all other structures in the excavated areas. Review with the Engineer, the distance to remain away from other structures within the excavated areas. Do not undercut sides of excavation. Damage to base rock, sub grade, paving, curbs or structures shall be repaired or replaced. Remove and dispose of asphalt debris, concrete, base rock, and existing soil in landscaped areas from the site.

C. In landscaped areas that were previously paved, excavate to a minimum depth of 24 inches measured from the former pavement surface, but not less than 18 inches below the indicated finish grade.

D. In planting areas not previously paved, excavate the existing soil to a depth of 18 inches and remove from the site. Measurement of depth is from the top of the adjacent curb or paving.

E. Backfill excavated tree and shrub planting areas with topsoil. Prior to installing topsoil, scarify the bottom of the excavation to a 6-inch depth. Do not scarify or undercut sides of excavations. The Contractor shall be responsible for protecting base rock and sub grade compaction under adjacent paving and curbs. Provide topsoil backfill in 6-inch lifts. Incorporate the first 6-inch lift of topsoil into the existing soil at the bottom of the excavation.

F. Refer to Section 31 00 00 - Earthwork, for requirements for disposal of surplus material from planting bed excavations.

3.03 ROUGH GRADING

A. Prior to any planting, grade all areas to be landscaped. Fill as needed or remove surplus dirt and float areas to a smooth uniform grade. Slope all planting areas to drain. Roll, scarify, rake, and level as necessary to obtain true, even planting surfaces. Rough grading shall be inspected and approved by the Engineer before any amendments and fertilizers are added.

B. Planting areas shall be thoroughly wetted down. Allow soil to dry so as to be workable, after which thoroughly cultivate to a depth of 6 inches using a rotary hoe.

C. Compact soil in planting beds to 75 percent relative compaction to prevent future settling.

3.04 SOIL PREPARATION

A. Soil Amendments, Fertilizers, and Cultivating:

1. Provide soil amendments, chemicals, and fertilizers herein before specified for both imported and approved on-site soils. These are minimum requirements. Provide such additional amendments and chemicals as are required by the Soil Reports.

2. Spread soil amendment and fertilizer evenly over all ground cover areas at the following rates:

   a. Soil Amendment: 6 cubic yards per 1,000 square feet.

   b. Fertilizer: 20 lbs. per 1,000 square feet of 6-20-20, (N-P-K).

3. After approval of amendment and fertilizer applications by the Engineer, incorporate soil amendments and fertilizers into the top 6 inches of soil by repeated rotary-hoe cultivation.

B. Watering: At completion of soil amendment and fertilizer installation, water the soil in all landscaped areas for a period of 14 days. Maintain sufficient soil moisture at all times to induce weed seed germination, but not to saturate the soil. Soil shall be moist to a minimum depth of 24 inches. In locations where irrigation is by drip or bubblers, the Contractor may, at its option and expense, install a temporary irrigation system to keep the soil moist.

3.05 HERBICIDE APPLICATION

A. Herbicide Application:

1. At the end of the watering period, spray the area with an Engineer-approved herbicide.

2. Apply herbicide according to the manufacturer's written application instructions. Alternate weeding methods may be used upon approval of the Engineer.

B. Pre-Emergent Herbicide Application:

1. Pre-emergent herbicide shall be applied to all landscaped areas, including plant basins. Apply prior to any mulching.

2. Pre-emergent herbicide shall be applied only when winds, if present, do not exceed five miles per hour.

3.06 FINISH GRADING

A. When weeding and soil conditioning have been completed and soil has been thoroughly water settled, all landscaped areas shall be finish graded for placement of plant materials. Grading shall be performed when the soil is at optimum moisture content for working.

B. Finished grades shall be in accordance with the grading details for mounding in landscaped areas. All landscaped areas shall slope uniformly for positive drainage.

C. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given, or between points established by walks, paving, curbs or catch basins. Finish grades shall be smooth, even, and on a uniform plane with no abrupt change of surface and no erosion scars.

D. Grading shall provide for natural runoff of water without low spots or pockets. Flow line grades shall be accurately set and shall be not less than two percent gradient unless otherwise indicated or approved by the Engineer.

E. Finish grade of earth in landscaped areas shall be one inch below the top of adjacent pavement, curbs or headers, with a gradual tapering away from these structures to a uniform depth of 3-1/2 inches below the top of adjacent pavement, curbs or headers, unless indicated otherwise on the Contract Drawings. Finish grade of earth shall be 3-1/2 inches below the top of pull and utility boxes or utility structures. Pull and utility boxes shall be adjusted by raising or lowering to conform to grading requirements in landscaped areas.

F. Tops and toes of all slopes shall be rounded to produce a gradual and natural-appearing transition between relatively level areas and slopes.

G. Protect all areas against compaction by construction equipment.

3.07 PLANTING OF TREES AND SHRUBS

A. Stake Plant Locations: Mark tree and shrub locations on site using stakes or similar means. Make adjustments to locations, where required by the Engineer, and locations shall be approved by the Engineer before plant holes are dug.

B. Planting Holes: Dig pits with vertical sides as indicated. After pits are dug, break the sides to open the wall of the pit for root penetration, and loosen the bottom of the pit to a depth of 3 inches. Perform a drainage test, as specified in Article 3.09, where required. Construct foot-tamped mound in the bottom of the pit to support the plant at the proper level.

C. Root Barriers: Install root barriers as indicated.

D. Watering Holes: Install watering holes as indicated.

E. Landscape Fabric: Install landscape filter fabric throughout all landscaped areas, except where ground cover is to be installed. The fabric shall be tucked into the soil 2 inches along the perimeter of the landscaped areas. Provide 1-foot overlaps at sides and ends. Secure against movement with specified anchorage staples. Furnish cutouts in the fabric to accommodate irrigation items and at tree, shrub, and vine planting locations.

F. Placement of Plants:

1. Do not handle container plants by the tops, stems, or trunks at any time. Lift all plants so that the root ball is supported from the underside. Plants that do not have a satisfactory root system will be rejected.

2. Cut the root ball vertically in a few places to encourage new feeder root development along the perimeter of the root ball.

3. All plants shall be planted immediately after rootballs are cut.

4. Place each plant in an upright and plumb position. One and five gallon size plants shall be set so that the top of the rootball is one inch above the finish grade. Fifteen-gallon size plants shall be set so that the top of the root ball will be 2 inches above the finish grade. Twenty-four inch and 36-inch box size trees shall have the top of the root ball set 4 inches above the finish grade. 15 gallon, 24-inch box, and 36-inch box trees in planting areas less than 6 feet wide shall have the top of the root ball set 2 inches above the finish grade.

5. Ground cover shall be installed at spacings indicated on Contract Drawings, and shall be evenly spaced and staggered in rows. Place each plant in a pit so that the root system lies free without doubling and so that the roots are planted vertically. Firm the soil around each plant and water the area immediately to avoid drying out.

G. Fertilizing: Place fertilizer tablets in the following quantities around the perimeter of plant hole:

Plant Size	**Qty. Fertilizer**
1 gallon plant	1 tablet
5 gallon plant	3 tablets
15 gallon plant	5 tablets
24-inch box plant	7 tablets
36-inch box plant	9 tablets

H. Backfilling:

1. Backfill holes and pits with topsoil. Ensure that proper irrigation will be maintained to the rootball. Taper backfill around sides and up to the top of the rootball so that sides of the rootball are not exposed.

2. Backfill for planting in areas where topsoil has been placed earlier shall be topsoil excavated from the planting hole. Backfill for plants in areas where existing site soil remains shall be the topsoil amended in accordance with the soil report.

3. Construct a 4-inch high berm (watering basin) around plant holes and fill the watering basin with Vitamin B-1 solution. Mix and apply the B-1 solution in accordance with the manufacturer's written instructions.
4. Backfill shall be watered until the backfill material is moist to the full depth of the hole.

I. Pruning: Pruning shall not be performed unless specifically requested or approved by the Engineer. Examine trees requiring pruning with the Engineer. Trees that are damaged due to improper pruning or wind damage shall be replaced.

J. Staking:

1. Remove the nursery stakes and install specified tree stakes along the sides of the root ball and one foot into undisturbed ground. Stakes shall not go through the root ball.

2. Ties shall be placed as low on the trunk as possible, but high enough so that the tree will return to the upright position after deflection.

3. Ties shall form a loose loop around the tree trunk, and shall be staked so that the trunk cannot work towards the support stakes. Tree ties shall be secured in position in accordance with the manufacturer's recommendations.

4. Support stakes shall not be higher than 6 inches above the tie locations. A flexible auxiliary stake shall be attached to those trees needing extra trunk support as determined by the Engineer.

5. One tree of each size shall be staked and approved by the Engineer prior to continued staking.

K. Adjustment of Plants:

1. Plants that settle deeper than specified shall be raised to the correct level.

2. Plants that go out of plumb shall be straightened and re-staked.

L. Top Dressing: Install a 3-inch layer of mulch in all landscaped areas. Mulch shall be kept away from stems and trunks of plants, and shall be kept off the foliage of ground cover. Install in tree watering basins.

3.08 DECOMPOSED GRANITE MULCH

A. The decomposed granite mulch shall be thoroughly blended with organic binder material at a rate of 10 pounds of binder material per ton of crushed granite screenings. Blending shall be done with a cement mixer, pug mill, or similar equipment prior to placing and spreading the blended decomposed granite mulch over the hand-compacted backfill.

B. The mulch shall be placed in two, 1-1/2-inch deep lifts compacted to a minimum 3-inch depth. Each lift shall be thoroughly moistened with water and then mechanically compacted to a minimum 85 percent relative density, with the finish surface of decomposed granite flush with surrounding curb and sidewalk..

C. Do not install decomposed granite mulch in tree watering basins.

3.09 DRAINAGE TEST AND AUGER HOLES

A. Requirements: After tree pits are dug and before planting operations, tree pits shall be water tested for drainage. One location per 80 square feet of tree pit shall be tested. In addition, test all tree pits in any area where a test tree pit does not drain within 24 hours, such as in hardpan areas, rocky ground, construction backfill, compacted areas, flat ground, low spots, and the like, in order to ensure that pits in those areas will drain properly.

B. Tests: Fill tree pits with water. Check holes after 24 hours to determine if water has drained out. If the water has not drained out, bring this to the attention of the Engineer for remedial course of action. Adjustment of pit size, adjustment of pit location, or addition of auger holes will be required by the Engineer if a drainage problem exists.

C Auger Holes: Auger one 6-inch diameter hole through the bottom of each excavated plant hole that does not drain within the specified 24 hour period. Depth of the drill measured from the bottom of the excavation to the bottom of the drill hole shall be 4 feet. Backfill auger holes with 3/4-inch diameter, well-graded drain rock up to bottom of the plant hole. Cover drain rock in the auger hole with a 2 feet by 2 feet piece of landscape filter fabric.

3.10 CLEANUP

A. Comply with the requirements of Section 01 74 14 - Cleaning.

B. Neatly dress and finish all landscaped areas.

C. Broom clean all pavements.

3.11 PRELIMINARY TO FINAL INSPECTION

A. At completion of the work of this Section, the Contractor shall request a preliminary inspection to determine the condition the of landscaped areas.

B. Inspection shall be requested two working days in advance.

C. The Contractor and Engineer shall be represented at the inspection.

D. Construction considered ready for inspection shall conform to the following requirements:

1. All planting shall be healthy and free of infestations.

2. All landscaped areas shall be free of weeds.

3. Stakes and ties shall be as specified.

4. Mulch shall be raked to a uniform surface.

5. Debris shall be removed from the landscaped area, pavements shall be broom clean, and foliage shall be washed clean.
6. All plants shall be installed in place as indicated and specified.

3.12 FINAL INSPECTION AND ACCEPTANCE

A. Final inspection will be conducted at the end of the Plant Establishment Period. Notice requesting final inspection shall be submitted by the Contractor to the Engineer at least 7 calendar days prior to the anticipated date.

B. Five days prior to the final inspection, 16-6-8 (N-P-K) granular form commercial fertilizer shall be applied to trees and shrubs, in the presence of the Engineer, as follows:

Plant Size	Qty. Fertilizer
Specimen, 24 inch and larger	6 tablespoons
15 gallon	4 tablespoons
3 and 5 gallon	2 tablespoons
1 and 2 gallon	1 tablespoon
Ground cover and vines	6 pounds per 1,000 square feet

C. Care shall be taken to prevent the deposit of fertilizer on stems or leaves. Fertilizer shall be spread with a mechanical spreader wherever possible. Fertilizer shall be applied only during favorable weather conditions to prevent dissipation by wind. All plants shall be thoroughly watered after fertilizer has been applied.

D. Mulch shall be raked away from around plant bases. Fertilizer shall be spread around each plant base and worked into the top 2 inches of soil. Mulch shall then be replaced.

E. Prior to final inspection, the Contractor shall also have performed weeding and a thorough cleaning of the landscaped areas.

F. The irrigation system shall be tested at the final inspection. Refer to Section 32 84 00 - Planting Irrigation, for additional information.

G. At the final inspection, the Engineer will determine the condition of the plants and improvements. Acceptance of this work will be contingent upon proper maintenance and the establishment of vigorous plant materials. Plants which are dead, unhealthy, or missing, whether by disease, neglect, vandalism, or any other reason, shall be replaced with the same species and sizes originally specified and following these same specifications for installation.

H. Provide plant replacements within two weeks after final inspection, and extend the Plant Establishment Period for an additional 30 calendar days after replacement planting has been accepted by the Engineer. The Engineer will then repeat the final inspection for the replaced plants at the end of the extended Plant Establishment Period.

3.13 MAINTENANCE AND PLANT ESTABLISHMENT

A. Maintain plant materials from the time of planting until the plant materials are well established and are exhibiting a vigorous growth. Maintenance shall continue until the end of the Contract Guaranty Period specified in Article 1.11 herein.

B. Maintenance shall include watering, cultivating, weeding, re-mulching, repair of stakes, fertilizing, cultivation, spraying, and pruning as required to keep the plant material in a healthy growing condition and to keep the planted areas neat and attractive in appearance throughout the maintenance period. Maintenance shall also include treatment for fungus, diseases, rodents, insects, and repair of vandalism.

C. All plants shall be watered not less than twice a week. Each watering shall be of such quantity as to provide optimum growing conditions. Rinse foliage of all plant materials as often as necessary to keep foliage free of dust.

D. Rocks, clods, and debris that appear on the surface shall be removed. Heaved, settled, or eroded areas shall be restored by excavating, addition of topsoil, filling, finish grading, and rolling as required.

E. Gravel, surplus earth, papers, trash and debris, which accumulate in the landscaped areas and the areas directly adjacent to the paved areas, shall be removed and disposed of weekly. Such areas shall be cared for as required to present a neat and clean condition at all times.

F. Provide weeding of all areas, at intervals of not more than 14 days, as follows:

1. Weeds which appear in asphalt, concrete, or paved areas within Contract limits shall be killed before they exceed 2 inches in height or spread, by spraying with a contact herbicide which shall not stain the surfacing.

2. Weeds in ground cover shall be killed by spraying with a contact herbicide, approved by the Engineer, before they exceed 2 inches in height or spread, or shall be removed by pulling with roots intact before they exceed 4 inches in height or spread.

3. Weeds between basins in areas planted with trees and shrubs shall be removed by pulling before they exceed 4 inches in height or spread. Weeds shall be removed from within basins, including basin walls, and from within planter boxes. Any weed not killed by spraying shall be pulled with its roots intact.

4. Before using any herbicide or pesticide, the Contractor shall obtain permits and approval from the jurisdictional authority for the proposed material and for the rate of application.

5. The Contractor shall submit material safety data sheets for all herbicides and pesticides in accordance with the requirements of Section 01 60 00, Product Requirements.

6. The Contractor shall be responsible for protecting all plants, on or off the site, from damage by spraying operations. Weed control shall be performed as often as required to maintain the project in a neat and weed-free condition at all times.

G. Watering shall be adequate to provide maintenance of healthy plant growth, and shall be controlled to prevent over saturation of soil leading to plant failure. Basins, where required, and basin walls shall be kept well formed.

H. Trees, shrubs, and ground cover shall be maintained by regular watering, cultivating, and weeding. Stakes and ties shall be repaired as needed. Plants shall be sprayed for insect pests and pruned as necessary or when requested by the Engineer. All damaged, unhealthy or dead trees, shrubs and ground cover shall, upon discovery of loss or damage, be replaced immediately with new stock of a size to match the remaining healthy plants of the same variety.

I. Until the end of the Plant Establishment Period, any plants which are damaged by herbicide, diseased, dead, or which are in an unhealthy condition exhibiting weakness and the probability of dying, shall be replaced within two weeks after notification from the Engineer. Replacements of plants shall be made in the same manner as specified for the original planting.

J. On the last day of the Plant Establishment Period, complete the weeding and raking of all planting areas. The site shall be cleared of debris and presented in a neat and orderly condition. All plants shall be in a healthy, thriving condition. Stakes shall be vertical. Paved areas shall be broom cleaned, and areas damaged by erosion shall be repaired, including the replacement of plants.

END OF SECTION 32 90 00